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cases in one operation, and others somewhat more complex in two.

For instance, if three sides are given and combined on the instrument, one of the angles will be shewn on the semicircular plane; or if an angle and two sides are given and combined upon the instrument, the third side can be read off upon the free link or upon the semicircle, according to the nature of the problem; but if two sides and an angle are given and an angle is required, or if two angles and a side are given, two operations would be necessary. They can be performed, however, with great rapidity.

The instrument can be used as a useful check to logarithmic computations; and as its accuracy is not inconsiderable [for instance, in a well-made instrument it would determine the hour-angle, or the azimuth from an altitude of the Sun, &c., taken near the prime vertical to about 20 seconds of time or 5′ of arc], it might sometimes stand in the place of logarithmic computations altogether, and be used as the companion to the sextant by navigators and travellers in unexplored regions; and especially so since by far the most accurate purpose to which it can be applied (so far as my experience of it enables me to speak) is in reducing the ordinary Lunar distance observation, by performing on the instrument the operation of "clearing the distance"—for the ratio between the effect of parallax on the measured distance and the parallax in altitude, can be found very readily and to a degree of accuracy not inferior to any other approximate method. The error, for instance, would scarcely ever exceed five seconds of arc; and a few printed tables can be affixed to the blank parts of the instrument to render it, for lunar measures, independent of all books, except the *Nautical Ephemeris*.

Radiant-Points of Shooting Stars. By William F. Denning, Esq., F.M.S.

(*Communicated by R. S. Greg, Esq., F.R.A.S., F.G.S.*)

The following Radiant-Points have been deduced from the observed paths of nearly 900 shooting stars, seen during the last four years at Bristol. The positions (which are chiefly those of the primary meteor-showers) have been ascertained by pencilling the courses on a Cary's 18-inch globe, and prolonging them backwards, the average places of convergence being selected as the approximate areas of radiation. The results were obtained independently of any previously published list; and a later reference to the valuable data of Professor Herschel, Mr. Greg,

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Dr. Schmidt, Capt. Tupman, and others, tabulated in the annual reports of the Luminous Meteor Committee of the British Association, show that in many cases there is a close agreement.

No. 1876. Denning.	Dates of Observations.		Radiant-Point.		Name or Position of Radiant.	No. in Greg's List, 1874.	Remarks.
			R.A. °	Dec. N. °			
1	1873	Jan. 2–3	234	48	North of α Boötis.	6	A marked shower.
2	1876	Mar. 12–17	184	54	ε Ursæ Majoris.	21	Also at *Cor Caroli.*
3	1874	April	223	45	Hercules.	48	3° N. of β.
4	1873–4	April	241	69	Draco.	57	Near ζ; same as 10?
5	1873–4	April	268	85	Polaris.	60	A marked shower.
6	1874	April	209	3 S.	Virgo.	62	12° E. of α.
7	1873–4	April 19–20	274	37 N.	Lyraids.	51	Mean of two showers; well observed.
8	1873	April 19—May 1	221	20	Boötes.	?	9° E. of α; doubtful.
9	1874	April 20	242	25	Corona.	67	9° E. of α.
10	1873	April 21	283	59	Draconids.	64	Precise at *o Draconis.*
11	1873	Apr. 21—May 1	173	64	Ursa Major.	?	Doubtful.
12	1873	April 21—May 1	189	60	ε Ursæ Majoris.	46	Connected with 2?
13	1873	June 25—July 8	164	57	Ursa Major.	76	Near β.
14	1873	July	267	49	Eridanus.	78	Near γ.
15	1875	July 7	344	27	β Pegasi.	96	Same as *Pegasids*?
16	1873	July 26—Aug. 11	2	27	α Andromedæ.	103	Identical with 17?
17	1873	Aug. 2–11	10	42	Andromeda.	98	Near the Nebula.
18	1871	Aug. 10	$37\frac{1}{2}$	$58\frac{1}{2}$	Perseids.	108	Central region well observed.
	1874	Aug. 10	44	$58\frac{1}{2}$			
19	1874	Oct. 17–18	34	18	Aries.	154	6° S.E. of α.
20	1874	Oct. 18–19	88	11	Orionids.	157	2° N. of ν.
21	1874	Oct. 19—Nov. 10	71	43	Auriga.	136	Near *Capella.*
22	1872	Nov. 6–10	64	20	Taurids.	156	Well observed.
23	1872	Nov. 27	29	46	γ Andromedæ.	172	A great shower.
24	1875	Dec. 19–23	277	73	χ Draconis.	?	Doubtful.
25	1872	Dec. 31	140	45	Ursa Major.	2	7° S. of θ.
26	1872	Dec. 31	164	20	δ Leonis.	?	Doubtful.
27	1872	Dec. 31	106	36	Geminids.	178	Near *Castor.*

Of the August shower in 1871, 260 meteors were seen in $8\frac{3}{4}$ hours on the 9th, 10th, and 11th. In 1874, 281 were counted

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in 4 hours, and 252 of them were Perseids. Of the April shower in 1873 18 Lyraids were seen, and 14 in 1874. In regard to the minor displays, the radiant-points have been determined from a smaller number of meteors, but in cases (and they were found numerous) where the number were insufficient to indicate them, the observations were discarded.

Mr. Greg's List (1874), to which references are made in the table, is published in *British Association Report*, 1874.

Observed Courses of 71 Bright Shooting Stars, seen at Bristol from November 1872 to March 1876.

By William F. Denning, Esq., F.M.S.

(*Communicated by R. S. Greg, Esq., F.R.A.S., F.G.S.*)

The bright shooting stars, whose apparent paths are recorded in the following list, were seen either during occasional watches for them or casually. The table only includes those estimated to equal or excel 1st mag. stars, and does not comprise the total number of such meteors seen here within the interval mentioned, for during the fine showers of November 27, 1872, and August 10, 1874, the paths of many of them were not noted, attention being mainly directed to the aggregate numbers visible, to eye-estimations of the radiant-points, and to other details.

The times of apparition may be relied on as accurate to within a minute or so; but in some cases a meteor was observed by me when absent from home, and on such occasions a watch had to be consulted for the time, which, however, I afterwards verified, and hence there is little chance of error on this account.

The magnitudes given are those of *maximum* brilliancy, and the comparisons are with planets or 1st mag. stars.

The observed paths were projected on a celestial globe, and the R.A.'s and Declinations of beginning and ending, together with the length of path, read off, the latter element being less carefully noted than the two former, which give the more important one of *direction*.

I have affixed a column giving the probable "Radiant by stars," and in finding these positions referred, in many doubtful cases, to Mr. Greg's "General Comparative Table of Radiant Positions and Durations of Meteor Showers" (*B. A. Report*, 1874), which is continued and extended from a similar catalogue by the same author in the *Monthly Notices R. A. S.*, vol. xxxii., pp. 345–55.

The column of "Notes" indicates either the path of the meteor amongst the stars, the rate of motion, or the appearance of a train and its duration.